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Wisconsin Department of Commerce

Evaluation # 200427-I

Safety & Buildings Division
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Wisconsin
Building Products Evaluation

Material	Insulated Concrete Form Wall System
Manufacturer	Plastiques Cellulaires Polyform, Inc. 454 Rue Edouard Granby, Quebec, Canada
Additional Listee	NUDURA Corporation 80 Ellis Drive, Unit 1 Barrie, Ontario, Canada L4M 6E7

SCOPE OF EVALUATION

GENERAL: This report evaluates the use of the insulated concrete form wall system, manufactured by Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation), evaluated as permanent form work and insulation system for reinforced lintels, exterior and interior bearing and non-bearing walls, and foundation and retaining walls. The Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete form wall system was evaluated for safety requirements of the foam plastic and structural requirements for the codes listed below.

The **Comm** code requirements below in accordance with the current **Wisconsin Uniform Dwelling Code for 1 & 2 family dwellings:**

- **Foam Plastic:** The Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete form wall system was evaluated in accordance with the fire safety requirements of **s. Comm 21.11**.
- **Structural:** The Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete form wall system was evaluated in accordance with the structural requirements of **ss. Comm 21.02,** and **21.02(3)(c)**.

The **IBC** requirements below in accordance with the **Wisconsin Amended ICC Code:**

- **Foam Plastic:** The Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete form wall system was evaluated in accordance with the fire safety requirements **ss. IBC 2603.1**, **2603.2**, and **2603.3**.
- **Structural:** The Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete form wall system was evaluated in accordance with the requirements of **IBC Chapter 16**.

Note: Structural calculations shall be submitted (job-to-job basis) in accordance with IBC Chapter 16 for Live, Ground Snow, Roof, Wind, and Seismic Loads.

DESCRIPTION AND USE

General: Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete form is manufactured using 100% modified expanded polystyrene from one of the following manufacturer Styropor. The forms are used as permanent formwork for structural concrete load bearing and non-load bearing residential and commercial, below- and above-grade wall. The forms are used in construction of plain and reinforced concrete beams, lintels, exterior and interior walls, foundation and retaining walls. The forms remain in place after setting of concrete and shall be protected by an approved interior and exterior finish material.

The Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms consist of hollow core forms of flat expanded polystyrene forms connected with hinged polypropylene bridge connector webs also used to attach interior and exterior finish materials.

The forms are available in a standard length of 96" (2438mm), height of 18 inches (457mm) and five standard widths of 9-1/4 inches (235mm), 11-1/4 inches (288mm), 13-1/4 inch (337mm), 15-1/4 inches (387mm), and 17-1/4 inches (438mm). The five widths have nominal concrete core widths of 4 inches (102mm), 6 inches (152mm), 8 inches (203mm), 10 inches (254mm) and 12 inches (305mm) respectively. Vertical and horizontal reinforcing steel, when specified, is placed the forms and is supported by the webs.

Materials consist of:

- **Polystyrene:** Nominal 1.25 pcf (20.1 kg/m^3) density.
- **Connector Element Webs:** Injection molded polypropylene hinged are cast into the EPS walls and used to attach interior and exterior finish materials. Webs are spaced 8 inches (203mm) on center.
- **Concrete:** Standard applications use a minimum 2900 psi (20.0 Mpa) at 28 days, with maximum 3/8-inch (10mm) aggregate for 4 inch (102mm) and 6 inch (152mm) concrete walls ans ¾-inch (19mm) for 8 inch (203mm) and 10 inch (254mm) concrete walls. Concrete of higher strength may also be used. The concrete can be poured from a truck, by hand, or bucket. A concrete pump utilizing a 2" to 2 1/2" hose is recommended. The concrete shall comply with **s. Comm 21.02(3)(b)** and **s. IBC 1903.1**.
- **Reinforcement:** All steel reinforcement shall be in accordance with **s. IBC 1903.5**.

Each pallet of Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms shall bear a label with the manufacturer's name, and the quality control inspection agency.

TESTS AND RESULTS

The tests and results listed below cover both the current **IBC** requirements:

EPS panel physical properties meeting the requirements of **ASTM C578** Rigid, Cellular Polystyrene Thermal insulation with individual test methods as follows:

- Density Test; **ASTM C1622**
- Flexural Resistance; **ASTM C203**,
- Compressive Resistance; **ASTM C1621**
- Polypropylene Reinforcing webs were evaluated as follows:
- Screw Withdrawal; **ICBO AC 166** and **ASTM D1761**
- Lateral Screw Resistance; **ICBO AC 116** and **ASTM D1761 NER**
- Tensile Strength; **ASTM D638**
- Ignition Temperature; **ASTM D1929** and UBC 26-6
- Burn Rate; **ASTM D635**
- Smoke Density; **ASTM D2843**

The above tests are combined into one test report by Intertek Testing Services NA Ltd., Report No. 3016348, March 26, 2002 signed by Kazamir Falconbridge and Cam Robinson, P. Eng.

- Standard Room Fire Test, prepared by Intertek Testing Services NA Ltd., Report No. 3017215(a), March 5, 2002 signed by Thomas Kitching, AScT and Michael Van Geyn, AScT.
- Testing for **ASTM C578** on EPS Foam manufactured from Starex SF 300 Series bead, prepared by Intertek Testing Services NA Ltd., Report No. 484-0925-B, dated July 29, 1999, and revised August 25, 1999, signed by Adam Smith and Sheldon Warman, P. Eng.
- Crawl Space Fire Test in accordance with SwRI 99-02, prepared by Intertek Testing Services NA Ltd., Report No. 3019583, dated June 26, 2002, revised October 17, 2002, and signed by Thomas Kitching, A.Se.T., Michael Van Geyn, A.Se.t. and Lawrence Gibson, P. Eng.
- Physical Properties of Starex SF-301H in accordance with CAN/ULC – S701-01, prepared by Intertek Testing Services NA Ltd., Report No. 3025950 Report No. 1, dated July 18, 2002 and signed by Paul Roberts and Vern W. Jones, C.E.T.
- **UL 723** and **ASTM E84** on EPS Foam manufactured from Starex SF 300 Series bead, prepared by Intertek Testing Services NA Ltd., Report No. 493-7895, dated August 1999, signed by Paul Saunier, AScT and Michael Van Geyn, AScT.
- Thickness of the Plastic Web Fastener Strips, prepared by Intertek Testing Services NA Ltd., Report No. 3025950, Report No. 3, dated July 19, 2002 and signed Paul Roberts and Vern W. Jones, C.E.T.
- Cold Temperature Screw Withdrawal Testing in accordance with **ASTM D1761** to 40°F, prepared by Intertek Testing Services NA Ltd., Report No. 3016348 Addendum 1, dated January 10, 2003 and signed by Craig R. Lawson, NZCE, and Cam Robinson, P.E..

LIMITATIONS OF APPROVAL

The **Comm** limitations below are in accordance with the current **Wisconsin Uniform Dwelling Code, for 1 & 2 family dwellings:**

- **Foam Plastic:** Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. Comm 21.11(1)**. Where a 1-inch thickness of masonry does not separate the polystyrene blocks from the building interior, including at the top of the wall, a thermal barrier, which has a finish rating of at least 15 minutes, shall be provided.

1. Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms are approved for use in combustible non-rated construction in accordance with **s. Comm 21.11**. In one- or two-family dwellings, thermal barriers shall be provided to separate the forms from the occupied space of the dwellings per **s. Comm 21.11**.
2. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.

- **Structural:** Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms are approved as structural building elements.

1. The units are approved for use as concrete forms for basement walls and exterior walls when the resulting concrete core thickness satisfies **Table 21.18-A** for one- or two-family dwellings, or when structural calculations for the product are submitted for review.
2. Walls shall be anchored to all floors and roofs. Walls shall be interconnected at corners by embedding and lapping the reinforcement.
3. Structures are **limited** to two stories in height.
4. The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
5. Below grade walls shall be damp-proofed when required by the local building department.
6. Damp-proofing and water-proofing materials shall be approved by Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) and the local building official, and shall be free of solvents that will adversely affect the EPS foam.

NOTE: Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms wall system was **not** evaluated for compliance with the thermal requirements of **Subchapter VI, ss. Comm 22.20**, **22.21**, **22.23**, **22.25**, **22.27**, **22.28**, and **22.31** of the current **Wisconsin Uniform Dwelling Code, for 1 & 2 family dwellings**.

The **IBC** limitations below are in accordance with the current **Wisconsin Amended ICC Code:**

- **Foam Plastic:** Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. IBC 2603.4.**

1. In accordance with **s. IBC 2603.4.1.6**, when Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms are used within the attic or crawl space where entry is made only for service utilities, the foam plastic insulation shall be protected against ignition by 1-1/2" thick mineral fiber insulation, a ¼" thick wood structural panel, particleboard or hardboard, gypsum wallboard, corrosion-resistant steel or other approved material installed so that the foam plastic is not exposed.
2. The protective covering shall be consistent with the requirements for the type of construction.
3. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.
4. The crawl space shall not be used for storage or air handling purposes, there are no interconnected basement areas and entry to the crawl space is only for service of utilities.

- **Structural:** Design of concrete formed by Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms must comply with **IBC Chapter 19** with the following requirements:

1. The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
2. Design calculations of walls must comply with **s. IBC 1901.2.** Use of the empirical design approach specified in **s. 2109.1 [Comm 62.2109(1)]** is prohibited.
3. Design of lintels shall comply with the applicable provisions of **IBC Chapter 16.**
4. Wall loading shall be in accordance with **IBC Chapter 16**.
5. Minimum wall reinforcement shall conform to **s. IBC 1901.2**. When the code requires that vertical and horizontal reinforcement be spaced no further apart than 18 inches or three times the wall thickness, whichever is less, the maximum concrete wall thickness along the length of the wall is permitted to be used to determine rebar spacing.
6. Walls shall be anchored to floors and roofs in accordance with **s. IBC 1604.8.2**. Walls shall be interconnected at corners by embedding and lapping reinforcement in accordance with the code.
7. Design of shear walls shall be in accordance with **ss. IBC 1901.2** and **1910**.
8. Structures are **limited** to two stories in height plus a basement.
9. Below grade walls shall be damp-proofed when required by the local building department, water-proofed in accordance with **s. IBC 1806**.
10. Damp-proofing and water-proofing materials shall be approved by Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) and the local building official, and shall be free of solvents that will adversely affect the EPS foam.
11. Special inspection is required as noted in **s. IBC 1704**, for placement of reinforcing steel and concrete, and for concrete cylinder testing, except that special inspection is not required for foundation stem walls conforming to **Table 1805.4.2** of the **IBC**. Additionally, when the building official approves, special inspection is not required when all of the following conditions are met:

    a) Wall systems are a maximum of 8 feet high and are limited to use in single-story construction of Group R-3, or Group U Occupancies.
    b) Maximum height of a concrete pour is 48 inches. Succeeding lifts must be placed in accordance with **s. IBC 1905.10.**
    c) Installation is by properly trained installers approved by Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation).
    d) The installation instructions indicate methods used to verify proper placement of concrete.

12. Walls constructed with Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms blocks, is considered Type V Construction.

NOTE: Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms wall system was **not** evaluated for compliance with the thermal requirements of **s. Comm 63.1018**.

Alternate Design: In lieu of calculations, the structural design of reinforced concrete formed by Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms wall system for residential construction is permitted to comply with the *Prescriptive Method for Insulating Concrete Forms in Residential Construction* (publication No. EB118), dated May 1998, published by the Portland Cement Association (PCA). Buildings constructed with the Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation) insulated concrete forms wall system and designed in accordance with the alternate design, will not exceed a height of two stories plus a basement, where the maximum unsupported wall height is 10 feet.

Identification: Each package bears a label specifying the name and address of the manufacturer Plastiques Cellulaires Polyform, Inc. (NUDURA Corporation). Additionally, product labels indicate the Wisconsin Building Product Evaluation Number (**200427-I**), and the name and logo of the quality control agency.

This approval will be valid through December 31, 2009, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The product approval is applicable to projects approved under the current edition of the applicable codes. This approval may be void for project approvals made under future applicable editions. The Wisconsin Building Product Evaluation number must be provided when plans that include this product are submitted for review.

DISCLAIMER

The department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement not specified in this document.

Revision Date:
Approval Date: October 21, 2004 By: _____

Lee E. Finley, Jr.
Product & Material Review
Integrated Services Bureau

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